(1 Hour) **[Total Marks: 25]**

N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any two* of the following: **13**

a. What is monolithic? Explain the disadvantages of monolithic over microservices.

b. Explain the various benefits of Microservices Architecture.

c. Explain the design model of microservice system.

d. Explain the microservice designs goals and principles.

2. Attempt *any two* of the following: **12**

a. Explain the various microservices boundaries.

b. Explain Asynchronous Message-Passing and Microservices.

c. Explain the role of API Gateway in microservices.

d. Explain the various tools and process guidance.

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(2 Hours) **[Total Marks: 50]**

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(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. **Attempt *any two* of the following:** **10**

a. What is Big Data? Explain the challenges associated with Big Data?
b. What is clustering? Describe the steps to find k clusters using k-means algorithm.
c. Explain data science pipeline in detail with a neat diagram.
d. Write the entire procedure with appropriate commands for importing data from MySQL to Hive.

2. **Attempt *any two* of the following:** **10**

a. What are the three characteristics of Big Data? Explain the differences between Business intelligence and Data Science.
b. Write a note on data science and data science process.
c. What are the key roles for the New Big Data Ecosystem? Explain in detail.
d. What are different phases of the Data Analytics Lifecycle? Explain each one in detail.

3. **Attempt *any two* of the following:** **10**

a. What is the role of support in Apriori algorithm? Also explain how the Apriori property works with an example.
b. What is linear regression? Explain in detail. Also explain any two applications of linear regression.
c. Explain with respect to Time series analysis how to model a structure of observations taken over time. Also explain any two applications of time series analysis.
d. Explain a probabilistic classification method based on Naive Bayes' theorem.

4. **Attempt *any two* of the following:** **10**

a. Explain with a neat diagram a small Hadoop cluster with two master nodes and four workers nodes that implements all six primary Hadoop services.
b. Explain functionality of map() function and reduce() function with a neat diagram in a MapReduce context.
c. Explain the concepts of Combiners and Partitioners in advanced MapReduce context.
d. Explain the need of Spark technology. Explain the concept of In-Memory Computing in Spark.

5. **Attempt *any two* of the following:** **10**

a. How HBase schema can be created? How data can be inserted? How cell values can be fetched? Explain with suitable example.
b. Explain with example Grouping and joining in context of Pig.
c. Write and explain with suitable example any three data analysis commands used in Hive.
d. Explain Spark SQL interface architecture with a neat diagram.

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(2 Hours) **[Total Marks: 50]**

N. B.: (1) **All** questions are **compulsory**.
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(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any two* of the following: **10**

a. Compare elastic and inelastic traffic.
b. Explain Software Defined Network Architecture .
c. What is the IEEE 802.1Q VLAN standard?
d. How would you implement QoS data plane components to manage network congestion effectively?

2. Attempt *any two* of the following: **10**

a. What is networking ecosystem?
b. Explain cloud computing.
c. Write short note on typical network hierarchy.
d. Explain the following concepts: -
   (i) Routing
   (ii) Big Data

3. Attempt *any two* of the following: **10**

a. How OpenDaylight architecture is structured and how its components interact?
b. Explain Traffic Engineering.
c. Write short note on Open Flow logical network device.
d. Compare and contrast the roles and impacts of Forwarding Abstraction, Distribution Abstraction, and Specification Abstraction on network.

4. Attempt *any two* of the following: **10**

a. Write short note on virtualized network function.
b. How OSS and BSS function together support network operations?
c. Explain Network Functions Virtualization (NFV) Management and Orchestration.
d. What is NFVI, and how does it utilize compute domain nodes in virtualized network environments?

5. Attempt *any two* of the following: **10**

a. Describe the ITU-T QoS architectural framework.
b. Write short note on layered approach of QoE/QoS model.
c. Explain the factors that influence QoE.
d. How Integrated Service architecture is used to manage congestion?

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